

# NTD4302

## Power MOSFET

68 A, 30 V, N-Channel DPAK

### Features

- Ultra Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Logic Level Gate Drive
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- $I_{DSS}$  Specified at Elevated Temperature
- DPAK Mounting Information Provided
- Pb-Free Packages are Available

### Applications

- DC-DC Converters
- Low Voltage Motor Control
- Power Management in Portable and Battery Powered Products: i.e., Computers, Printers, Cellular and Cordless Telephones, and PCMCIA Cards

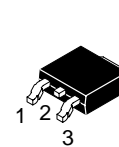
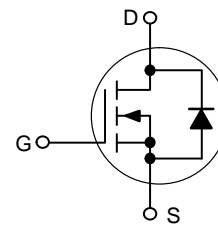


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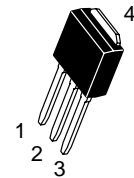
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
30 V	7.8 mΩ @ 10 V	68 A

### N-Channel

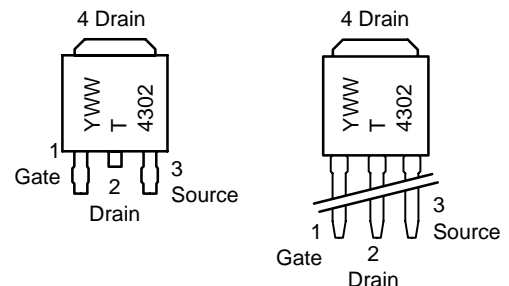


**CASE 369C  
DPAK  
(Surface Mount)  
STYLE 2**



**CASE 369D  
DPAK-3  
(Straight Lead)  
STYLE 2**

### MARKING DIAGRAM & PIN ASSIGNMENTS



T4302 = Device Code  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NTD4302

## MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	30	Vdc
Gate-to-Source Voltage – Continuous	V <sub>GS</sub>	±20	Vdc
Thermal Resistance – Junction-to-Case	R <sub>θJC</sub>	1.65	°C/W
Total Power Dissipation @ T <sub>C</sub> = 25°C	P <sub>D</sub>	75	W
Continuous Drain Current @ T <sub>C</sub> = 25°C (Note 4)	I <sub>D</sub>	68	A
Continuous Drain Current @ T <sub>C</sub> = 100°C	I <sub>D</sub>	43	A
Thermal Resistance – Junction-to-Ambient (Note 2)	R <sub>θJA</sub>	67	°C/W
Total Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	1.87	W
Continuous Drain Current @ T <sub>A</sub> = 25°C	I <sub>D</sub>	11.3	A
Continuous Drain Current @ T <sub>A</sub> = 100°C	I <sub>D</sub>	7.1	A
Pulsed Drain Current (Note 3)	I <sub>DM</sub>	36	A
Thermal Resistance – Junction-to-Ambient (Note 1)	R <sub>θJA</sub>	120	°C/W
Total Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	1.04	W
Continuous Drain Current @ T <sub>A</sub> = 25°C	I <sub>D</sub>	8.4	A
Continuous Drain Current @ T <sub>A</sub> = 100°C	I <sub>D</sub>	5.3	A
Pulsed Drain Current (Note 3)	I <sub>DM</sub>	28	A
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150	°C
Single Pulse Drain-to-Source Avalanche Energy – Starting T <sub>J</sub> = 25°C (V <sub>DD</sub> = 30 Vdc, V <sub>GS</sub> = 10 Vdc, Peak I <sub>L</sub> = 17 Apk, L = 5.0 mH, R <sub>G</sub> = 25 Ω)	E <sub>AS</sub>	722	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T <sub>L</sub>	260	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. When surface mounted to an FR4 board using the minimum recommended pad size.
2. When surface mounted to an FR4 board using 0.5 sq. in. drain pad size.
3. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.
4. Current Limited by Internal Lead Wires.

## ORDERING INFORMATION

Device	Package Type	Package	Shipping†
NTD4302	DPAK	369C	75 Units / Rail
NTD4302G	DPAK	369C (Pb-Free)	75 Units / Rail
NTD4302-001	DPAK-3	369D	75 Units / Rail
NTD4302T4	DPAK	369C	2500 Tape & Reel
NTD4302T4G	DPAK	369C (Pb-Free)	2500 Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>OFF CHARACTERISTICS</b>						
Drain–Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μA) Positive Temperature Coefficient	V <sub>(BR)DSS</sub>	30 –	– 25	– –	Vdc mV/°C	
Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = 30 Vdc, T <sub>J</sub> = 25°C) (V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = 30 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	– –	– –	1.0 10	μAdc	
Gate–Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	–	–	±100	nAdc	
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc) Negative Temperature Coefficient	V <sub>GS(th)</sub>	1.0 –	1.9 –3.8	3.0 –	Vdc	
Static Drain–Source On–State Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 20 Adc) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 10 Adc) (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 5.0 Adc)	R <sub>DS(on)</sub>	– – –	0.0078 0.0078 0.010	0.010 0.010 0.013	Ω	
Forward Transconductance (V <sub>DS</sub> = 15 Vdc, I <sub>D</sub> = 10 Adc)	g <sub>FS</sub>	–	20	–	Mhos	
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	(V <sub>DS</sub> = 24 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	–	2050	2400	pF
Output Capacitance		C <sub>oss</sub>	–	640	800	
Reverse Transfer Capacitance		C <sub>rss</sub>	–	225	310	
<b>SWITCHING CHARACTERISTICS (Note 6)</b>						
Turn–On Delay Time	(V <sub>DD</sub> = 25 Vdc, I <sub>D</sub> = 1.0 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 6.0 Ω)	t <sub>d(on)</sub>	–	11	20	ns
Rise Time		t <sub>r</sub>	–	15	25	
Turn–Off Delay Time		t <sub>d(off)</sub>	–	85	130	
Fall Time		t <sub>f</sub>	–	55	90	
Turn–On Delay Time	(V <sub>DD</sub> = 25 Vdc, I <sub>D</sub> = 1.0 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 2.5 Ω)	t <sub>d(on)</sub>	–	11	20	ns
Rise Time		t <sub>r</sub>	–	13	20	
Turn–Off Delay Time		t <sub>d(off)</sub>	–	55	90	
Fall Time		t <sub>f</sub>	–	40	75	
Turn–On Delay Time	(V <sub>DD</sub> = 24 Vdc, I <sub>D</sub> = 20 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 2.5 Ω)	t <sub>d(on)</sub>	–	15	–	ns
Rise Time		t <sub>r</sub>	–	25	–	
Turn–Off Delay Time		t <sub>d(off)</sub>	–	40	–	
Fall Time		t <sub>f</sub>	–	58	–	
Gate Charge	(V <sub>DS</sub> = 24 Vdc, I <sub>D</sub> = 2.0 Adc, V <sub>GS</sub> = 10 Vdc)	Q <sub>T</sub>	–	55	80	nC
		Q <sub>gs</sub> (Q1)	–	5.5	–	
		Q <sub>gd</sub> (Q2)	–	15	–	
<b>BODY–DRAIN DIODE RATINGS (Note 5)</b>						
Diode Forward On–Voltage (I <sub>S</sub> = 2.3 Adc, V <sub>GS</sub> = 0 Vdc) (I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc) (I <sub>S</sub> = 2.3 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	V <sub>SD</sub>	– – –	0.75 0.90 0.65	1.0 – –	Vdc	
Reverse Recovery Time	(I <sub>S</sub> = 2.3 Adc, V <sub>GS</sub> = 0 Vdc, di <sub>S</sub> /dt = 100 A/μs)	t <sub>rr</sub>	–	39	65	ns
		t <sub>a</sub>	–	20	–	
		t <sub>b</sub>	–	19	–	
Reverse Recovery Stored Charge	Q <sub>rr</sub>	–	0.043	–	μC	

5. Indicates Pulse Test: Pulse Width = 300 μsec max, Duty Cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperature.

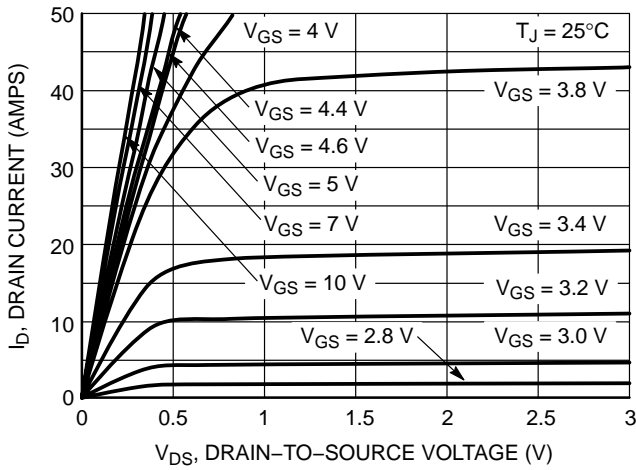


Figure 1. On-Region Characteristics

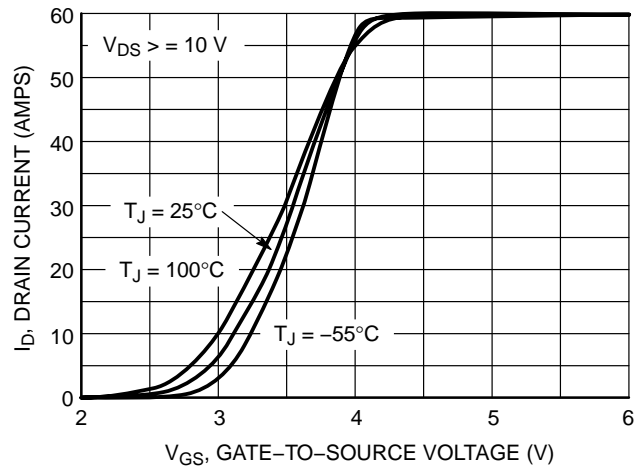


Figure 2. Transfer Characteristics

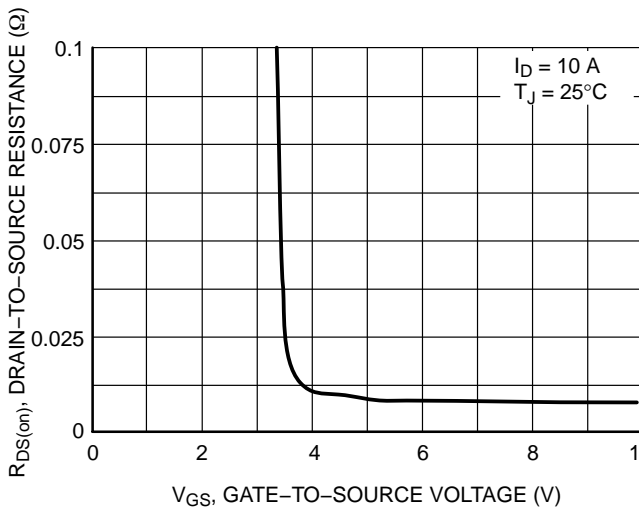


Figure 3. On-Resistance vs. Gate-to-Source Voltage

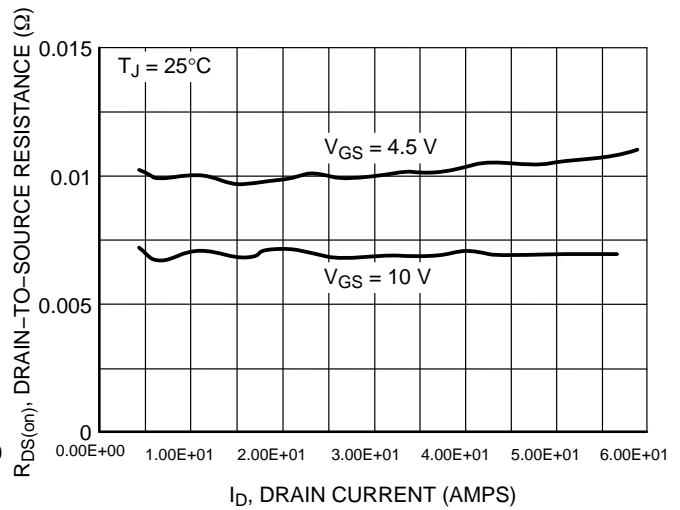


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

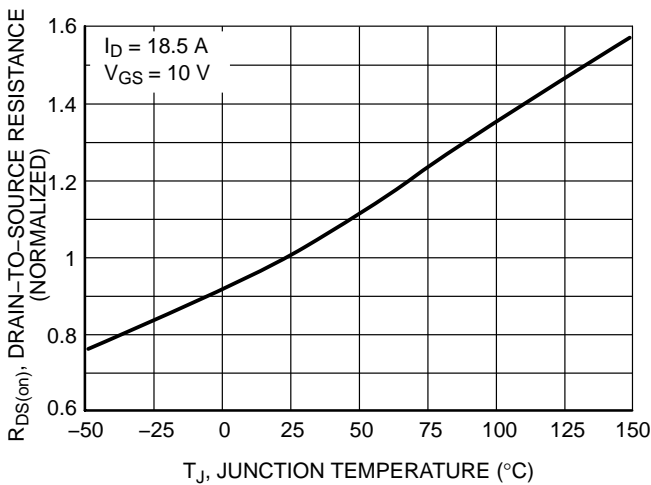


Figure 5. On-Resistance Variation with Temperature

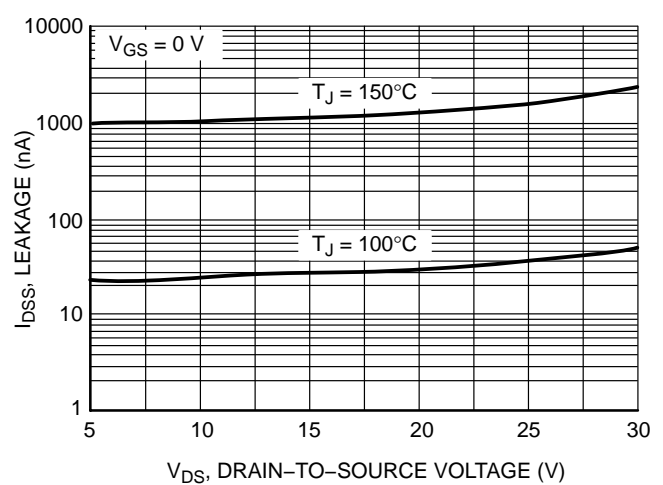


Figure 6. Drain-to-Source Leakage Current vs. Voltage

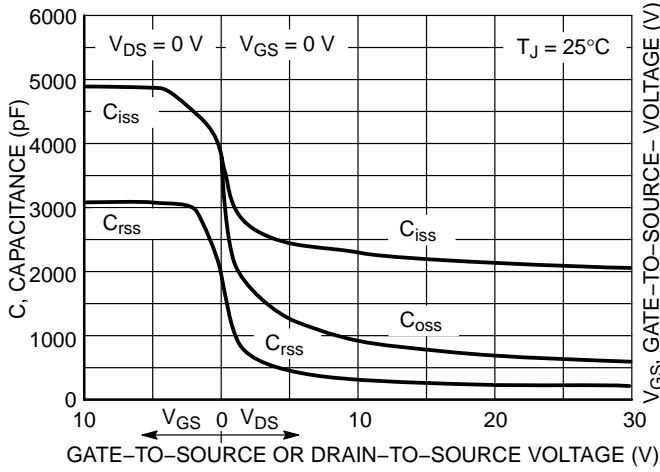


Figure 7. Capacitance Variation

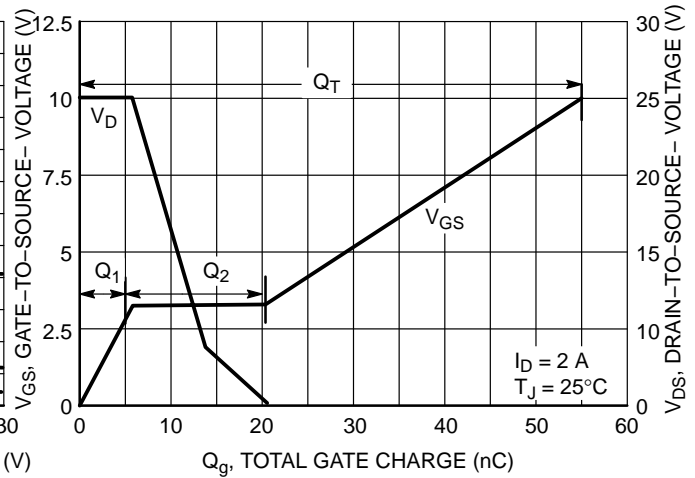


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

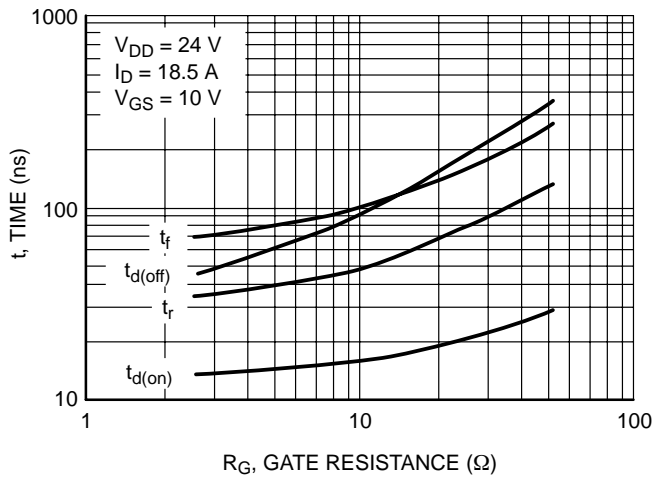


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

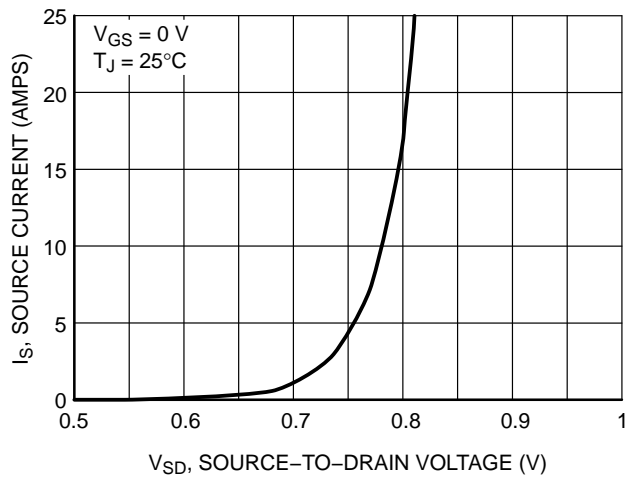
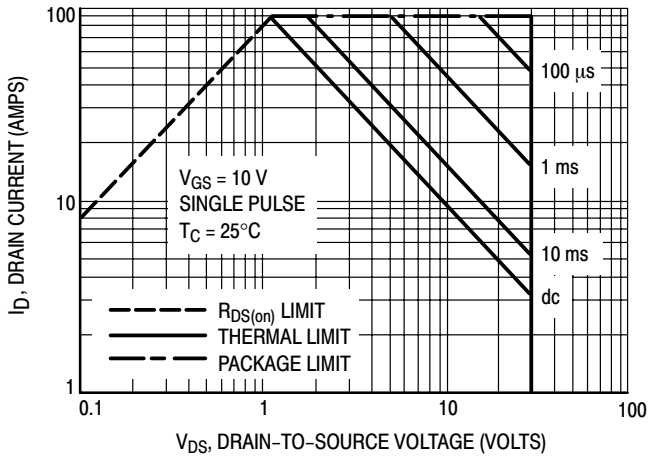
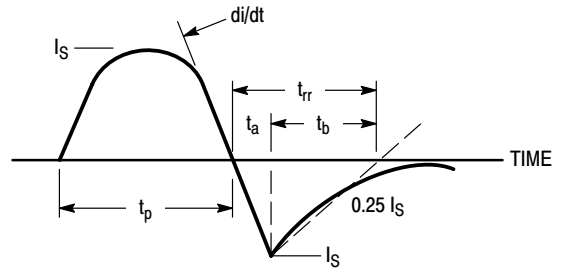


Figure 10. Diode Forward Voltage vs. Current

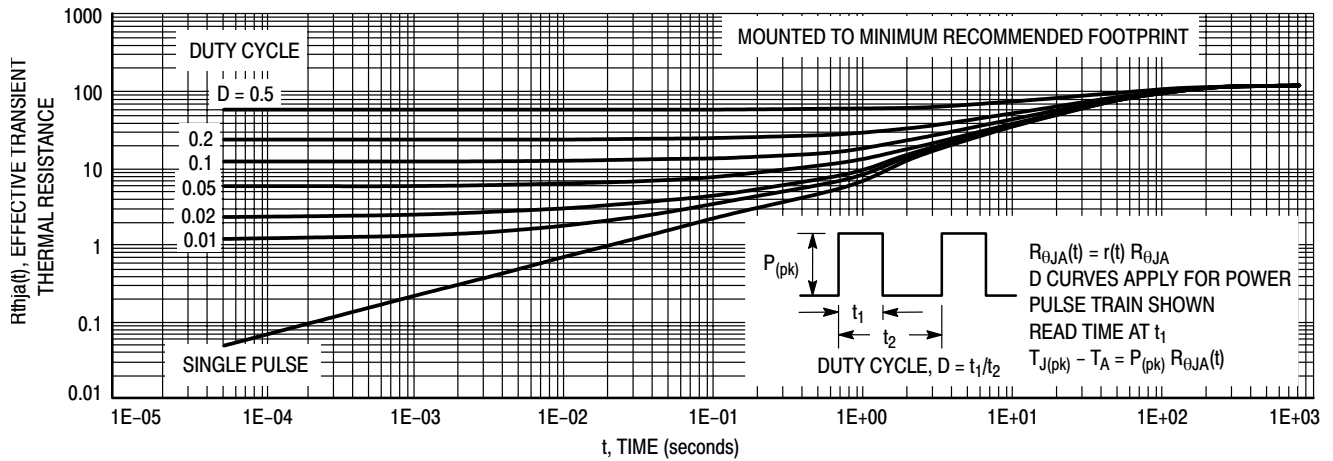
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**Figure 11. Maximum Rated Forward Biased Safe Operating Area**



**Figure 12. Diode Reverse Recovery Waveform**

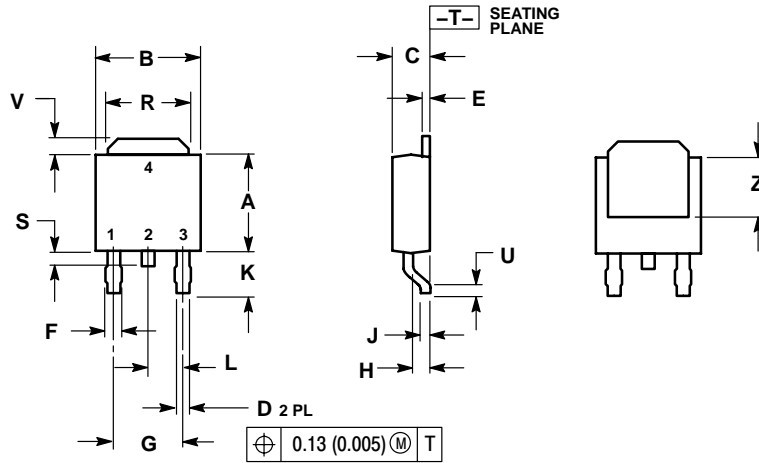


**Figure 13. Thermal Response – Various Duty Cycles**

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## PACKAGE DIMENSIONS

DPAK  
CASE 369C  
ISSUE O

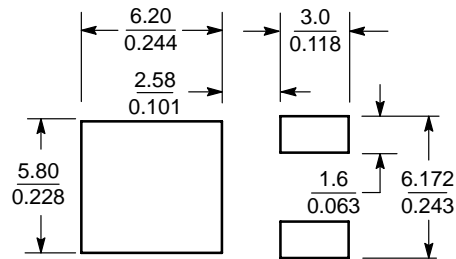


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

- STYLE 2:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

### SOLDERING FOOTPRINT\*



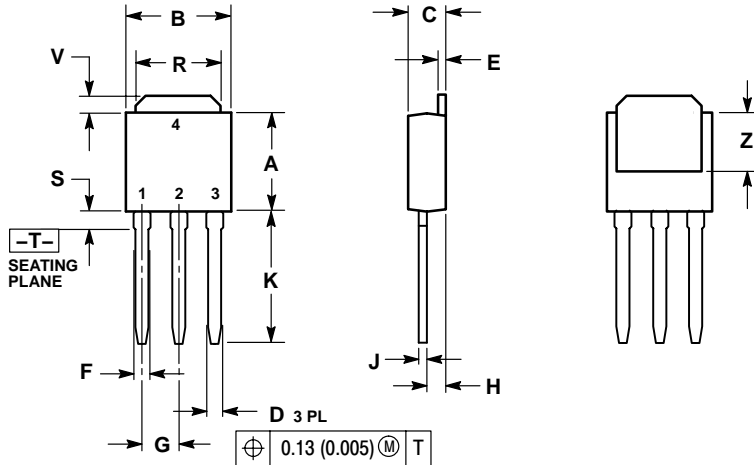
SCALE 3:1  $\left( \frac{\text{mm}}{\text{inches}} \right)$

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

### DPAK-3 CASE 369D-01 ISSUE B



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

**STYLE 2:**

- PIN 1. GATE
- DRAIN
- SOURCE
- DRAIN

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